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STATUS OF A SPEAR-MARKED BLACK MOTH INFESTATION IN INTERIOR ALASKA

G. L. Downing, Entomologist

In August 1957 field detection reports were received from Bureau of Land Management and Alaska Forest Research Center personnel reporting white birch (Betula papyrifera Marsh.) defoliation in the Fairbanks area. This defoliation occurred over a large area surrounding Fairbanks, being especially noticeable in the Birch Lake- Harding Lake area. Subsequently, the insects responsible for this defoliation were reared from pupae to adults in Juneau. Dr. E. L. Todd, of the Insect Identification Laboratory, Agricultural Research Service, identified the adults as being the spear-marked black moth, Eulype hastata (L.)

Exploratory studies of the biology and control of this insect begun in May, 1958, will be covered in a separate report. In addition to these studies, observations and surveys were made to determine the extent and trend of the infestation.

LIFE HISTORY

Briefly, the life history of the insect is as follows: E. hastata has a one-year life cycle in Alaska. Eggs are laid throughout most of June, with the larvae feeding within an enclosure of one to several leaves which have been webbed together along their edges. One to four or more larvae feed within each of these enclosures. The larvae progress through four instars before pupating in the ground litter in late July and early August. Winter is passed in the pupal stage and adult emergence takes place during late May and throughout most of June.

The preferred host is white birch, although several other hosts are attacked, including alder and willow.

AERIAL SURVEY

An aerial survey to determine the exterior boundaries of the infestation was made in mid-August when defoliation was most evident. This consisted of aerial sketch-mapping the exterior limits of the infestation on $\frac{1}{4}$-inch = 1 mile maps while flying at speeds of 85 to 95 miles per hour

at 600 feet above ground level. Total flying time was 13:05 hours.

The gross area involved in the infestation is 5,829,000 acres, of which approximately 333,000 acres are considered as heavily defoliated. In general the infestation extends north to Livengood, south to Tok Junction, east to Chena Hot Springs, and west to Nenana. Heaviest defoliation occurs around Birch and Harding Lakes, near Lake Mansfield, on several drainages east of Delta Junction and a small area southwest of Livengood.

INFESTATION TREND

Apparently there was a population build-up in 1956 which went unnoticed and did not cause any appreciable defoliation. In 1957 this population erupted over a large area and caused widespread defoliation, which prompted the first reports of this insect's activities. This year (1958) the insect population increased, causing defoliation over a larger area. In mid-July a decline became noticeable and by August it was apparent that the population had been severely reduced. The cause of this sharp decline was two-fold: (1) a disease and; (2) insect parasitism.

The disease is believed to be primarily responsible for the decline. Diseased larvae began to show up when the insect reached the third and fourth instars around mid-July. Disease was evidenced by dead and dying larvae hanging limp from vegetation throughout the area. Two collections of diseased larvae were sent to Dr. E. A. Steinhaus, Director of the Laboratory of Insect Pathology, University of California. He reported that they were primarily infected with granulosis virus although several other pathogens were also present. The most important of the secondary pathogens was a Microsporidia. He reported that this is the first record of a granulosis virus in E. hastata.

Insect parasitism is also known to have been a factor in the decline. Larval parasites were noted when they emerged from fourth instar larvae and formed white cocoons in the duff. Some indication of larval parasite abundance can be gained from two pupal surveys that were made.

In late May and early June of 1958 overwintering E. hastata pupae and larval parasite pupae were collected from the duff within a three-foot by three-foot frame from several different locations. A total of 189 square feet of surface area were sampled in this manner. E. hastata pupae averaged 4.7 and larval parasite pupae 1.2 individuals per square foot.

In August 1958 after pupation was complete for the season a similar sampling was made but this time on a much reduced scale, using one square foot frames and a total of only 30 square feet of surface area. E. hastata pupae averaged 0.3 individuals per square foot and larval parasite pupae 3.2 individuals per square foot. Samples were obtained from the same general areas in both cases.

These two surveys indicate that a 97% decline occurred in the E. hastata population while a 260% increase occurred in the larval parasite population.

Although these data are meager they reflect the general conditions that were observed in the field.

Parasites other than those collected in the duff are known to occur but they are not believed to be as important.

The parasitic insect specimens are now in the process of being identified by specialists.

CONCLUSION

It appears that natural control factors have once again interceded to benefit man. The amount and duration of this benefit, however, are yet to be fully appraised. Observations and data collected to date point to a return to endemic conditions, but these are from accessible areas which comprise but a relatively small part of the total infestation area. This coupled with the known tremendous potential that insects possess for increasing their numbers, should be sufficient reason for viewing the population decline with some caution.

Although it is not expected that control in any form will be necessary, the feasibility of biological control, utilizing the newly found granulosis virus, is being explored.

Further observations and field sampling are planned for the 1959 season.